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# SCIENCE

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## CONTEMPORARY DETERRENTS TO THE PROCESS OF CLINICAL MEDICINE<sup>1</sup>

INTRODUCTION.—It has been said that "Methods and view points rather than men determine periods in the history of medicine." Following an era dominated by the study of structural pathology and of those physical signs expressive of structural change, there occurred a rather abrupt transition to a period characterized by investigation of the *function* of the various organs of the body in health and disease. Within the past fifty years there has been an increasing utilization of the sciences of chemistry, physics, biology, and mathematics, employed by investigators in their endeavor to measure function in exact ways, to estimate the degree of functional impairment in an organ diseased, to establish diagnosis upon a functional basis, and to institute therapy along lines calculated to prevent *functional* deterioration. By some, the contemporary period is termed "the golden age in medicine." That period will have come more truly when there is a more appropriate correlation between functional impairment and structural change. Contemporary medicine has lost somewhat by its neglect of pathological anatomy.

This "functional" period in medicine has been marked by numerous well recognized trends. It has witnessed the development of an enormous number of laboratory tests and procedures. Many mechanical devices and instruments of precision have been introduced, designed to detect the slightest deviation from the so-called normal. The period has been associated with the sub-division of medicine into a great number of specialties, and a marked re-

<sup>1</sup> Presidential address read before the American Congress on Internal Medicine, at Rochester, Minnesota, April 7, 1922.

placement of the general practitioner by specialists. Changes have been so varied and rapid that medical education has been unable to keep pace with the growth of new theories, new methods, and new ideas of practice: with a result that the medical student of the day is subjected to a type of education which is, in the words of a well known college president, "about half a century behind other forms of higher instruction." Research and prematurely published articles are dominant features of the time. Progress during this era of "specialized functional-diagnosis" has unquestionably been great, yet humanity comes very far short of getting out of the medical profession the aid which it is capable of furnishing.

An analysis of these dominant factors in contemporary medicine reveals a timely and merited attempt to reduce medicine to the realms of a pure science, or, as one particular enthusiast states it, "Medicine should now be generally recognized as an independent science, dealing with the phenomena of disease." This statement may be accepted if by science is meant *knowledge* gained by systematic observation, experiment and reasoning. Reason, however, must always operate within experience, never beyond it. Science is experience becoming rational. Rationalized science becomes an art through the skillful application of knowledge to practice.

Clinical medicine will always remain an art expressing itself by the practical application of all scientific experience toward the cure, alleviation or prevention of disease; in this pursuit it does and must enlist in its service all of the sciences. "A good internist will be a better one if he is well trained in the so-called medical sciences, but the sum total of all the sciences does not make internal medicine, nor is a brilliant scientific education a prerequisite, for a useful clinical career." The sciences give the true clinician some of his most useful tools, but they do not constitute his art. Many of the factors to which may be ascribed the brilliance of contemporary medicine in a scientific sense are, in part, at least, responsible for some well recognized defects in the practice of clinical medicine that may actually hinder its progress. A brief consideration of some of them would, therefore, seem timely.

#### (A) THE MENACE OF EXCESSIVE LABORATORY PROCEDURES

The elaboration and perfection of a large number of laboratory procedures has been a natural development in the evolution of contemporary medicine. To deny their usefulness would be absurd; to be forced to practice clinical medicine without laboratory facilities would be disastrous; to deny that important advances in clinical medicine have come from laboratory studies would be untrue. Every one admits that the patient dare not be studied at the bedside alone. It is certain that laboratories in the future will continue to play a dominant rôle in the advancement of medicine. It is equally true that medical investigation has gone more and more away from men engaged in clinical practice into the hands of laboratory workers, many of whom possess but a limited view of the problems which daily beset the practitioner. The enthusiasm for more accurate *diagnosis* characteristic of contemporary medicine, has, apparently, led many practitioners to believe that the laboratory simplifies everything; many actually seem to draw the inference from reading current laboratory advertisements, that clinical study can often be dispensed with in favor of containers for specimens, gratuitously supplied by commercialized laboratories. This excessive reliance upon laboratory tests has hindered the progress of clinical medicine in various ways as a result of:

- (1) A tendency prematurely to accept and apply new laboratory tests of promise.

- (2) The indiscriminate utilization of accepted laboratory procedures that are in reality of value only in a limited domain.

- (3) An improper interpretation of tests of known value through ignorance of their clinical significance.

- (4) An unwise reliance on positive laboratory findings to establish a diagnosis to the exclusion of other data, that may, perhaps, be much more important.

One witnesses examples of these and other errors almost daily. The total number of laboratory procedures or tests in themselves pathognomonically diagnostic is very small. There is practically none if diagnosis is understood to include, as it should, not only the cause of

the disease, but also its location, and the degrees of resultant structural functional impairment.

Confusion obviously exists, particularly among general practitioners, as to the correct use of many current laboratory procedures. This must in some way be overcome if the dangers arising from their improper utilization are to be eliminated, chief among which is an incorrect or incomplete diagnosis, and therefore inefficient service to the patient. Ways must be found to control or to limit the widespread application of tests that should be confined to well organized medical clinics, until the results there obtained have been subjected to long and critical analysis. The same is true of procedures requiring a degree of special technical ability not possessed by the average practitioner or technician employed by him. Witness merely as one example the widespread and misapplied study of basal metabolism, an instance of the mischief that inevitably follows the random use of mechanical methods. As Sir James Mackenzie has well put it, "While it may be claimed that we have one hundred new methods for investigating disease in the living, it must also be recognized that we have one hundred more ways for going astray. The benefit to the patient is often doubtful, and the employment of many contemporary laboratory methods in the contemporary manner is often harmful." The unintelligent use of laboratory tests is one etiological factor for the contemporary fibrosis and atrophy of the emotion of wonder and its associated instinct of curiosity: together "they arouse the impulse to approach and examine more closely the object or difficulty which excites them. Demand for the solution of a perplexity is the steadying and guiding factor in the entire process of reflection. Laboratory tests have certainly encouraged the development of a certain "naïveté of diagnosis" which seriously threatens the cultivation of a healthy curiosity.

#### (B) SPECIALISM AND SPECIALISTS

Contemporary specialism has been unavoidable. It has been pointed out that specialism is calculated to increase productivity, to facilitate the acquisition of accuracy, speed and

skill, to provide a better distribution of tasks, to economize material equipment and mental energy, and to accelerate discovery and invention. Barker refers to a "virtuous circle," "for on the one hand specialism increases knowledge, and on the other the growth of knowledge and technique creates new specialties. Human wants grow as knowledge and skill increase, and ever new types of medical men must emerge to supply the services that will adequately satisfy these wants." Viewed from this rather broad philosophic standpoint, as well as from a purely practical one, it is probably true that the "abolition of specialism would compel a return to a darker age of medical practice."

But, whether specialism with its increasing sub-division can be applied to clinical medicine in the same way that it has been to commerce and industry is a very debatable question. Certain dangerous aspects of specialism are thought by many to be responsible for admitted deficiencies in the practice of medicine of to-day. These dangers doubtless represent not so much arguments against specialism as against its indiscriminate or unwise use. In specialism one easily recognizes the lure for those whose ambitions are more for material reward than for human uplift. To specialism may be attributed the existing inequality of the financial compensation of the specialist and of the general practitioner, and hence the economic situation that explains in part the present inadequate supply of physicians in rural communities. A contemporary anonymous writer sees the origin of specialism in surgery. The degree of specialism that has developed in this one *branch of medicine* alone has been as extraordinary as it has been absurd. It is cheerful, therefore, to read from no less a pen than that of William J. Mayo: "Surgery should be put back where it belongs—a means of mechanical therapy in conjunction with medicine which should not continue in competition with the internist, as it has in the past." Specialism has been responsible for the development of what might be termed class discrimination in the profession, by which the so-called general practitioner has seemed to lose caste. Applied to patients, it has also fostered a feeling of

class distinction, for many assume that the services of specialists are far beyond their means, when, as a matter of fact, such is not usually the case. The charge that the medical profession, as a whole, has rapidly become an organized financial institution is as untrue as it is unjust. Misapplied specialism is at least one explanation for the recourse of many misguided individuals to some one or other of the commercial cults, which prey like parasites upon their human victims. The greatest danger of all to clinical medicine lies in the fact that specialism carries with it the inherent danger of narrowness and monotony, potential foes of the faculty of concentration, the power of observation and decisive correlation. It tends fundamentally to destroy those intimate relations between physician and patient that constitute the very essence of the healing art. Osler, in 1919, wrote: "The extraordinary development of modern science may be her undoing. Specialism has fragmented the specialties themselves in a way that makes the outlook hazardous. The workers lose all sense of proportion in a maze of minutiae." The profession and public, as a whole, appreciate the great services rendered by specialists. They are certainly indispensable. Specialism can probably not be checked, but unless its abuses are restrained a dark era in clinical medicine will have to be faced. Sanity and extremes never mix.

#### (C) CHANGES IN MEDICAL PRACTICE

The development of "group clinics" is the most striking contemporary change in the practice of medicine and is a direct result of modern specialism. Group practice unquestionably has many definite advantages, but it is unquestionably destined to failure unless it consistently deals cooperatively and unselfishly with the general practitioner. All arguments that may be advanced in favor of group practice are outweighed if this fundamental consideration be neglected. This is but another way of saying that group medicine can justify its existence only in so far as its superior facilities for study and diagnosis can be directly transferred back to the patient through the medium of his family physician. The difficulties and dangers inherent in specialism become even

more real in "diagnostic groups" unless there is the highest type of analysis and integration of the work done by the several specialists practicing together. Such analytical power is not possessed by many. It can be acquired only through long clinical experience, active clinical teaching and the opportunity to keep in touch with the advances in those specialties useful in clinical practice. It is rather hard to believe that men who possess these qualifications of the "diagnostic integrator" will serve the public and profession best by analyzing the reports of specialists. Granted that the work skillfully done is correctly analyzed and properly applied, failure none-the-less threatens "group medicine" if it be forgotten that impersonality in the practice of medicine inevitably foreshadows loss to the public.

#### (D) CHANGES IN MEDICAL EDUCATION

That there is something wrong with medical education almost every one will admit. Just where the defect lies, what the reasons are, and what constitutes the solution, remain somewhat obscure. Probably the most significant change in contemporary medicine from an educational standpoint has been the introduction of the so-called full-time system in the clinical departments. It is advocated by those who believe "that there exists, or can be created, such a thing as a science of medicine, which can best be fostered by giving it a place in which it can grow unhampered by the restrictions of practice." They claim that a close association between medical education and practice is by no means essential, and seem to resent the conception of clinical medicine as an application of the science to an art, or craft, or vocation. In these university medical schools with whole time clinical teaching, the number of students is to be limited and the selection of applicants would seem to favor most those of research tendencies and scientific trend. "The teachers should be carefully chosen young men who have shown ability not only to teach but also to aid in extending the boundaries of medical knowledge." The plan, as outlined by one author, whom I quote, "will not provide the student with the wide experience with disease in its various manifestations which would make him an able practitioner. Modern devel-

opments require for medical education a scientific basis with a final polish added by a preceptor system correctly applied."

There is such a thing as *impractical* idealism being carried too far. Every one admits the merits and advantages of full-time teachers, in medicine, as in any other science. Certainly no one could belittle the importance of research; only a traitor to the ideals of the medical profession would seek to hinder in any way the closest practical correlation between clinical teaching, research laboratories, and experimental studies. The whole basis for medical advance has been founded upon just this co-operation between the clinical practitioner, artisan if you will, and the research devotee, each serving and advancing the same science, but there never has been, and never can be, created a science of medicine apart from the practice of clinical medicine. If this be true, any educational movement designed to segregate one from the other will be disastrous to each. It is not implied that the advocates of full-time medicine actually have any such idea in mind, yet many believe their academic tendencies have made them lose sight of certain fundamental and practical issues. The so-called full-time movement probably is a step in the right direction. It is an experiment the results of which must be awaited with patience. If it is to be the best system applied to medical education, it is imperative that certain guiding principles be borne in mind as the scheme is worked out. To an active practitioner and teacher some of the most important points would seem to be these:

1. The fundamental *duty* and *moral* obligation of any medical school is to supply a needy public with an *adequate* number of alert, sane, and trustworthy practitioners as eager to prevent as to cure disease. This demands that they be well grounded in those essentials upon which the intelligent practice of medicine is based. To meet this need contemporary medicine must undertake a radical revision of both the pre-medical and the medical curriculum along lines that will better develop altruistic and humanitarian motives as the controllers of scientific ardor. The elective system should be encouraged in certain ways but discouraged in others; undergraduate specialism curtailed;

and *research*, during student years, to the neglect of acceptable proficiency in the fundamental sciences and their practical application prohibited or at least critically limited. "Applying themselves early to research young men get into back waters far from the main stream. They quickly lose the sense of proportion, become hypercritical, and the smaller the field, the greater the tendency to megalomania" (Osler). It is believed that if medical schools would uniformly adopt such policies, the public would be the gainer, specialties would not lack for devotees, nor would scientific advancement be hindered. Wise education seeks to simplify and make clear—never to complicate and confuse.

2. The teachers employed in meeting this moral obligation must be qualified both to impart knowledge and to inspire enthusiasm. These requirements can not be met except by men who have demonstrated their ability to advance clinical medicine. Clinical teachers of this type can never be replaced, at least from the students' viewpoint, by younger men of great promise, but deficient in a most important attribute, namely, "responsible experience." It must be remembered that students are best stimulated by contact with clinicians of mature development and accredited success. Such men can neither be created merely by appointment nor developed by fiat. There is food for serious reflection as to the correctness of a contemporary system that fails to give to medical students the *best* teachers available.

3. A medical school does not completely fulfill its moral obligation to the community by the conferring of medical degrees. It is obligated to keep behind its graduates—and provide for them, as well as other practitioners, ready means for post-graduate instruction, for training in the various specialties, and for opportunities for higher research work. Facilities, money and teachers alone will not meet the demands. Of the greatest influence in a medical school is a harmonious whole, and enthusiastic cooperation of faculty, students, and alumni, in the performance of a common task, and a total abstinence from the slightest trace of intolerant cliquism. Regardless of the size or source of the budget, medical education is bound to fail in schools in which such an

atmosphere is not developed and maintained.

4. Finally, a medical school, both by precept and example, must seek to inoculate a sustaining philosophy in the souls of its graduates. The philosophy of medicine implies a cheerful acquiescence to the burdens of the day. It inspires the unfortunate and cheers the depressed. It teaches how to encourage the hopeless as well as to relieve the suffering. It provides courage and fortitude with which to meet sorrow and disappointment. Lived up to, it insures a geniality of soul and tolerance for the opinions of others. Dishonesty is its most hated foe. Such a philosophy is needed by every successful clinician: it is practical even though idealistic. It does not develop best in the materialistic atmosphere of a pure science not learned and pursued in love.

CONCLUSION.—Brief reference has been made to a few of the dangers inherent in some of the very factors that have made contemporary medicine so brilliant. To infer anything short of an attempt to be constructively critical is to misconstrue. It is hoped that every clinical practitioner and teacher will ponder deeply on these and kindred topics, for clinical medicine is destined to come into its own in the near future. This will be hastened if the entire profession takes a more active share in the direction of education and the enforcement of needed reforms.

Progress and optimism are the natural progeny of health; they wither in the face of disease. Preventive medicine, through domination of the forces of nature and their utilization in promoting the welfare of mankind, is the ultimate goal of medical science. Through science the facts are discovered, through clinical practitioners their application is effected. The prevention and cure of many diseases to which mankind is heir depends neither upon the acquisition of knowledge through scientific research alone, nor its proper application to patients in the limited domain of each practitioner. Medicine must have behind it the tremendous power of a concordant public opinion. To win this, scientists, teachers and practitioners must miss no opportunity to become active agents in the proper transmission of all useful knowledge to the public at large. In no other way can humanity be freed from the pernicious

influence of quack remedies, cults of false pretenses, and a host of kindred delusions which drain the physical and financial and psychic resources of thousands every year. When fads and personal whims are kept constantly subservient to the weight of judiciously proved opinion, and if devotion to truth characterizes the daily life of student and physician—a grateful public will generously support all forms of needed medical investigation.

SYDNEY R. MILLER

### PHOTOPERIODISM, THE RESPONSE OF THE PLANT TO RELATIVE LENGTH OF DAY AND NIGHT<sup>1</sup>

IN an article published in 1920<sup>2</sup> data were presented tending to show that the length of day may exercise a remarkable regulatory action in initiating or inhibiting sexual reproduction in plants. In a number of species studied it was found that ordinarily the plant can attain the flowering and fruiting stage only when the length of day falls within certain limits so that in such cases flowering and fruiting occur only at certain seasons of the year. In this respect some species and varieties respond to long days while others respond to short days. Moreover, some plants are much more sensitive to change in length of day than are others. Since the publication of this paper the investigations have been extended to cover various other features of plant activity as affected by the prevailing length of day, including increase in stature, aerial and subterranean branching, formation of tubers and bulbs, root-growth, leaf-fall, dormancy and rejuvenescence. In collaboration with C. W. Bacon of this office fairly extensive biochemical studies of the subject have been carried out to ascertain the nature of the internal chemical changes involved and their relationship to the observed responses

<sup>1</sup> The writers are indebted to Mr. O. F. Cook, of the Bureau of Plant Industry, for suggestion of the term *photoperiodism* to designate the phenomena in question.

<sup>2</sup> "Effect of the Relative Length of Day and Night and Other Factors of the Environment on Growth and Reproduction in Plants," in *Journal of Agricultural Research*, Vol. XVIII, No. 11, March 1, 1920, pp. 553-606.